

IN THE CLAIMS

14. (original) A transmission line element, in an integrated circuit chip, comprising:

a plurality of metal layers in the integrated circuit chip, each of said metal layers being separated from an adjacent said metal layer by at least one dielectric layer;

at least first and second conductors in the integrated circuit;

the first conductor comprising at least two transmission lines, at least some of the at least two transmission lines of the first conductor being in different said metal layers, and a plurality of first electrical connections through which the at least two transmission lines are electrically connected to one another; and

the second conductor comprising at least two transmission lines, at least some of the at least two transmission lines of the second conductor being in different said metal layers, and a plurality of second electrical connections through which the at least two transmission lines are electrically connected to one another,

wherein the at least first and second conductors run parallel to one another, the at least two transmission lines in said at least first and second conductors run parallel to one another, at least one transmission line in each of the at least first and second conductors is edge-coupled to at least one said transmission line another said conductor and broadside-coupled to at least one said transmission line in another said conductor.

15. (original) The transmission line element of claim 14, wherein at least a second transmission line in said at least first and second conductors is edge-coupled to at least one said

transmission line in another said conductor and broadside-coupled to at least one said transmission line in another said conductor.

16. (original) The transmission line element of claim 14, wherein the first conductor comprises a third transmission line running parallel with the other transmission lines of the first conductor, the third transmission line being electrically connected to at least one other of the transmission lines of the first conductor, edge-coupled to at least one said transmission line in said another said conductor, and broadside-coupled to at least one other said transmission line in said second conductor, and

wherein the second conductor comprises a third transmission line running parallel with the other transmission lines of the second conductor, the third transmission line being electrically connected to at least one other of the transmission lines of the second conductor, edge-coupled to at least one said transmission line in another conductor, and broadside-coupled to at least one other said transmission line in another said conductor.

17. (original) The transmission line element of claim 16, wherein the third transmission line of the first conductor is in a same metal layer as another of the transmission lines of the first conductor, and the third transmission line of the second conductor is in a same metal layer as another of the transmission lines of the second conductor.

18. (original) The transmission line element of claim 16, wherein the third transmission line of the first conductor is in a different said metal layer than any of the other transmission lines of the first conductor, and the third transmission line of

the second conductor is in a different metal layer than any of the other transmission lines of the second conductor.

19. (original) The transmission line element of claim 14, wherein the at least first and second transmission lines comprise a plurality of segments, with a linear length of each said segment being less than 30 degrees of an operating frequency of a transformer formed by the at least first and second conductors.

20. (original) The transmission line element of claim 15, wherein the at least first and second transmission lines comprise a plurality of segments, with a linear length of each said segment being less than 30 degrees of an operating frequency of a transformer formed by the at least first and second conductors.

21. (original) The transmission line element of claim 20, wherein none of the transmission lines of any of the at least first and second conductors is edge coupled or broadside coupled to any other said transmission line of the same conductor.

22. (original) The transmission line element of claim 14, further comprising:

a third said conductor, said third conductor comprising at least two transmission lines running parallel to one another, with at least some of the transmission lines of the third conductor being in different said metal layers, and a plurality of third electrical connections through which the at least two transmission lines of the third conductor are electrically connected to one another.

23. (original) The transmission line element of Claim 22, wherein each of said first, second and third conductors comprises three transmission lines, each of the transmission lines of the respective conductor being in a different said metal layer.

24. (original) The transmission line element of claim 14, wherein the first conductor crosses over itself and over the second conductor, and the second conductor crosses over itself and the first conductor.

25. (original) The transmission line element of claim 14, wherein the first conductor crosses over itself, and over the second conductor, at least twice, and the second conductor crosses over itself, and over the first conductor, at least twice.

26. (original) The transmission line element of claim 14, wherein the transmission lines of the first and second conductors in one said metal layer have a region of discontinuity between a pair of the first electrical connections and a pair of the second electrical connections, respectively, but the transmission lines of the first and second conductors in another said metal layer are continuous in the same region.

27. (original) A transmission line element, in an integrated circuit chip, comprising:

at least a first and second metal layers, and at least one dielectric layer, in the integrated circuit, each said metal layer being separated from another said metal layer by a said dielectric layer;

at least a first transmission line and a second transmission line formed in said first metal layer;

at least a third transmission line and a fourth transmission line formed in said second metal layer,

wherein the first, second, third, and fourth transmission lines run parallel to each other, the third transmission line is vertically aligned with the first transmission line, and the fourth transmission line is vertically aligned with the second transmission line; and a plurality of metal vias each extending through at least one said dielectric layer,

wherein the first and fourth transmission lines are electrically connected through at least two said vias, and the second and third transmission lines are electrically connected through at least two said vias.

28. (original) The transmission line element of claim 27, wherein there is a third said metal layer separated by at least one said dielectric layer from the first and second metal layers, and further comprising:

fifth and sixth transmission lines formed in the third metal layer and running parallel to the first, second, third, and fourth transmission lines,

wherein said fifth transmission line is vertically aligned with the first and third transmission lines, with the third transmission line being vertically between the first and fifth transmission lines, and is electrically connected to at least one of the first and fourth transmission lines through at least one said via, and

wherein said sixth transmission line is vertically aligned with the second and fourth said transmission lines, with the fourth transmission line being vertically between the second and

sixth transmission lines, and is electrically connected to at least one of the second and third transmission lines through at least one said via.

29. (original) The transmission line element of claim 27, wherein there is a fifth transmission line in the first metal layer and a sixth transmission line in the second metal layer,

said fifth and sixth transmission lines being vertically aligned with each other and running parallel to the first, second, third, and fourth transmission lines,

said fifth transmission line being electrically connected to a nearest of the transmission lines of the second metal layer through at least one said via, and

said sixth transmission line electrically connected to a nearest of the transmission lines of the first metal layer through at least one said via.

30. (original) The transmission line element of claim 27, wherein the integrated circuit includes a region, between portions of the first and second transmission lines, where the first and second transmission lines are discontinuous, but the third and fourth transmission lines are continuous.

31. (original) The transmission line element of claim 30, wherein in said region, other portions of the first and second transmission lines cross the third and fourth transmission lines.

32. (original) A transmission line element, in an integrated circuit chip, comprising:

a plurality of metal layers in the integrated circuit chip, each of said metal layers being separated from an adjacent said metal layer by at least one dielectric layer; and

a plurality of parallel conductors each comprising at least two parallel transmission lines in an electrical connection with one another, each of the transmission lines being formed in one of the metal layers,

wherein at least one of the transmission lines of each said conductor is in a different said metal layer than another of the transmission lines of the same conductor, and

wherein each of the at least two transmission lines in each said conductor is edge-coupled to at least one transmission line of another said conductor, and broadside-coupled to at least one transmission line of another said conductor.

33. (original) The transmission line element of claim 32, wherein none of the at least two transmission lines in any said conductor is either edge coupled or broadside coupled to any other of the at least two transmission lines of the same conductor.

34. (original) The transmission line element of claim 32, wherein each transmission line of each of the conductors is electrically connected to a different said transmission line of the same conductor at at least two points, each of the at least two points comprising a via that extends through at least one of the dielectric layers.

35. (original) The transmission line element of claim 32, wherein each said conductor comprises at least two segments, wherein a linear length of each said segment is less than 30

degrees of an operating frequency of a transformer formed by the plurality of conductors.

36. (original) A transmission line element formed in an integrated circuit chip comprising:

at least first and second conductors in the integrated circuit extending parallel to one another, the at least first and second conductors each comprising at least two parallel transmission lines, at least some of the transmission lines of the respective conductor being in different metal layers of the integrated circuit chip, each said metal layer being separated from an adjacent said metal layer by a dielectric layer;

a plurality of interconnects located at predetermined positions along said conductors, each of said interconnects containing an electrical connection between the transmission lines of each of respective at least first and second conductors,

wherein a linear distance along the respective conductors between adjacent pairs of the interconnects is less than 30 degrees of an operating frequency of a transformer including the at least first and second conductors.

37. (original) The transmission line element of claim 36, wherein at least one transmission line in each of the at least first and second conductors is edge-coupled to at least one said transmission line in another said conductor and broadside-coupled to at least one other said transmission line in another said conductor.

38. (original) The transmission line element of claim 37, wherein every transmission line in each of the at least first and second conductors is edge-coupled to at least one said



transmission line in another said conductor and broadside-coupled to at least one other said transmission line in another said conductor.

39. (original) The transmission line element of claim 37, wherein every transmission line in each of the at least first and second conductors is edge-coupled to at least one said transmission line in another said conductor and broadside-coupled to at least one other said transmission line in another said conductor, and none of the transmission lines of any of the at least first and second conductors is edge-coupled or broadside coupled to any other of the transmission lines of the same conductor.